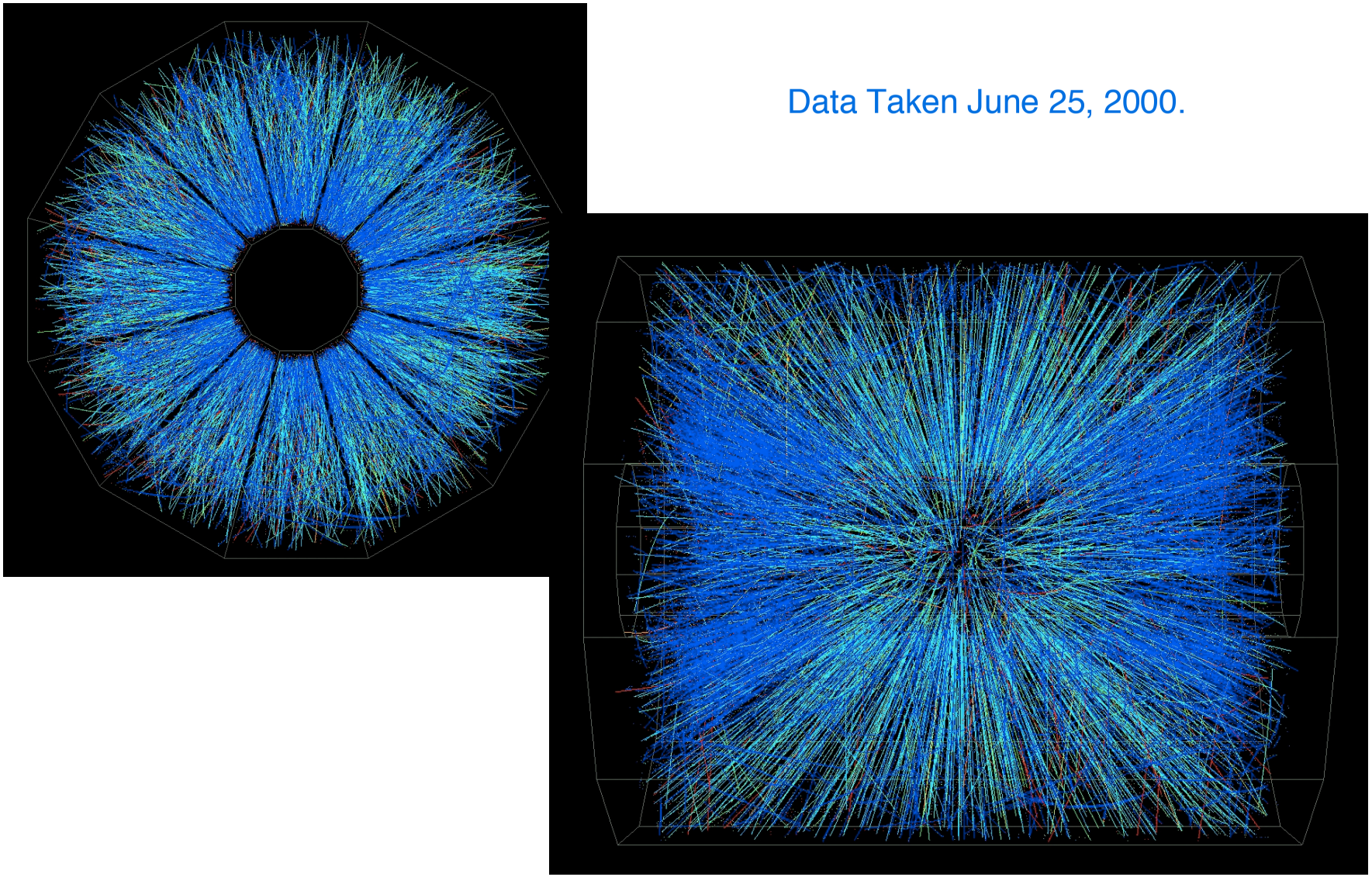
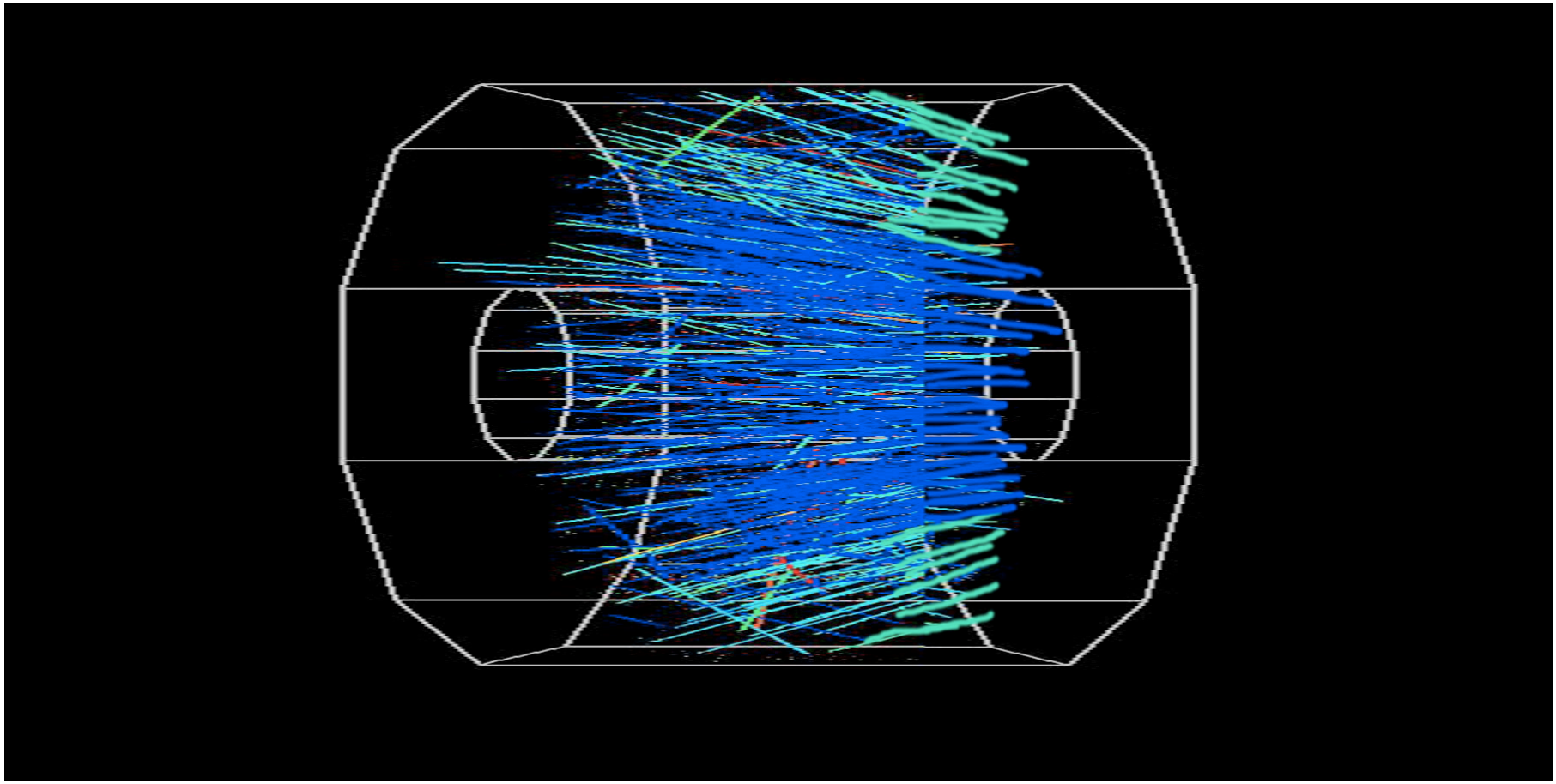
SpaceCharge Calibration into the future and demands on the trigger, now.

We think of our events like this …

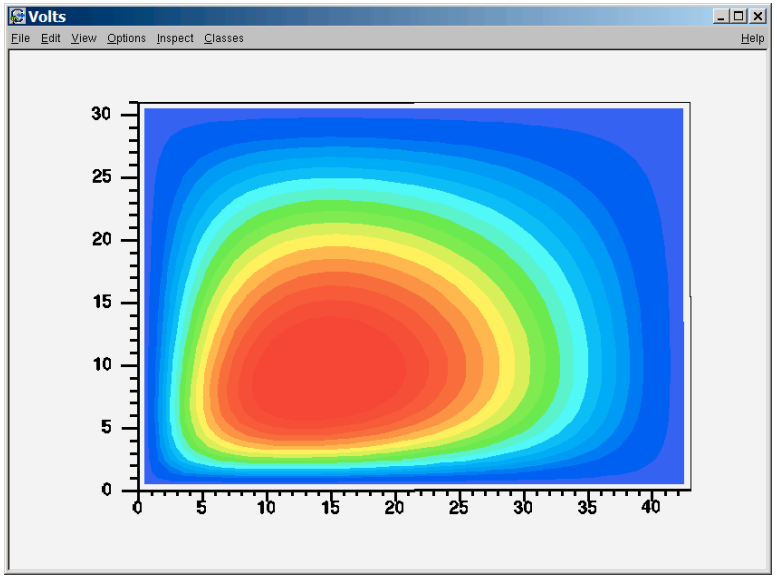


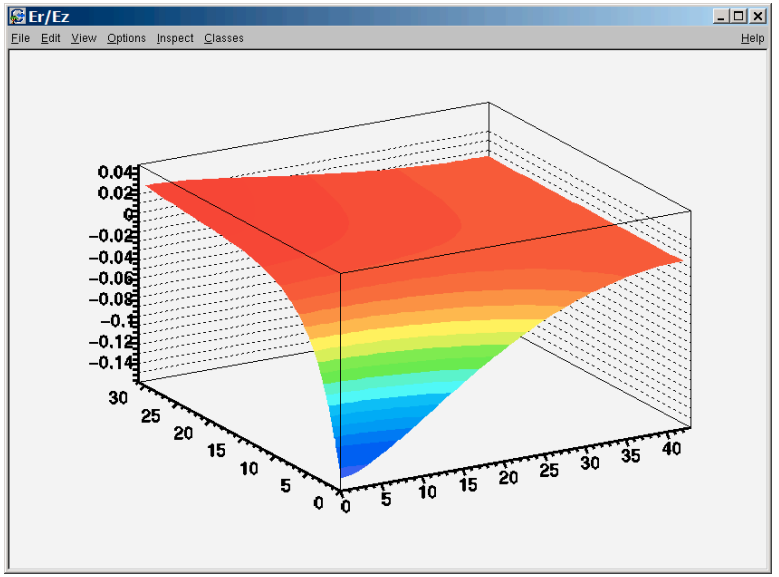
Data Taken June 25, 2000.

Most of our events look more like this …



SpaceCharge from the events cause distortions





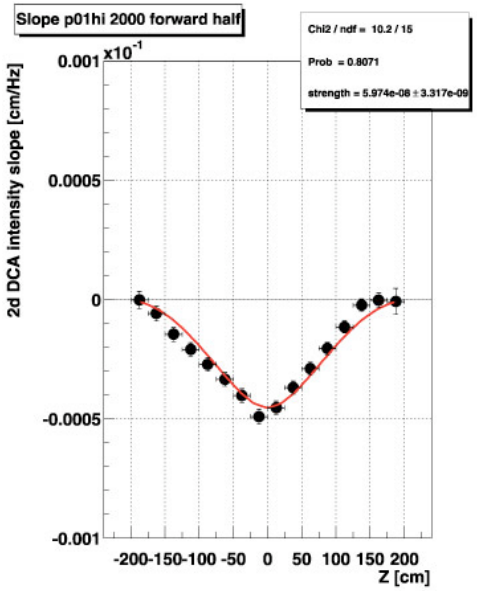
Two sources of SpaceCharge

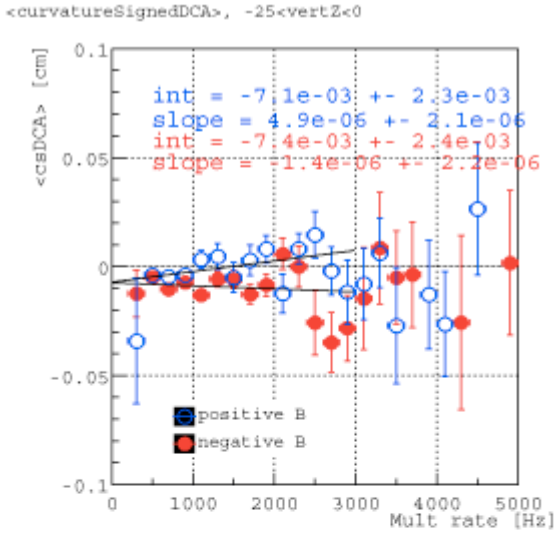
- **Beam gas and other up stream events**
  - not synchronous with our trigger
  - Scales with beam intensity (*not Luminosity*)
- **The collisions at STAR**
  - synchronous with out trigger
  - Scales with Luminisity
- **In the future, the average Luminosity will go up a factor of 40 but the beam intensity will only go up a factor of 2 to 4 !**
  - We have to prepare for a significant increase in space charge due to the collisions in the detector.
  - We have to be able to distinguish the two sources of distortion

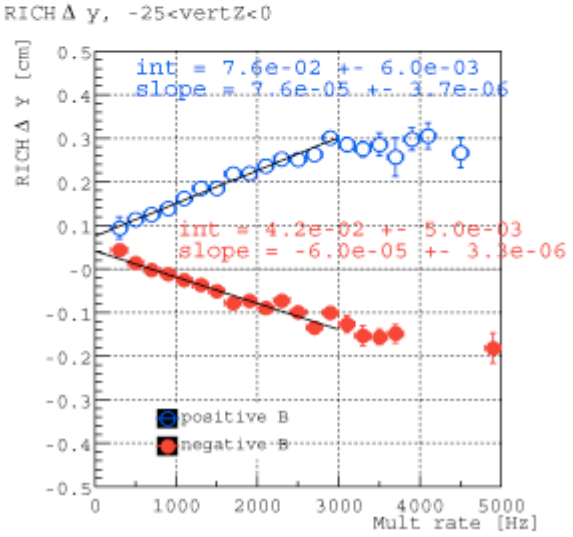
We have to be able to distinguish the two sources of distortion

Model for the distortions

- **Old Model**
  - Beam gas events leave a uniform deposition of charge in the TPC
  - The charge from the events is not significant

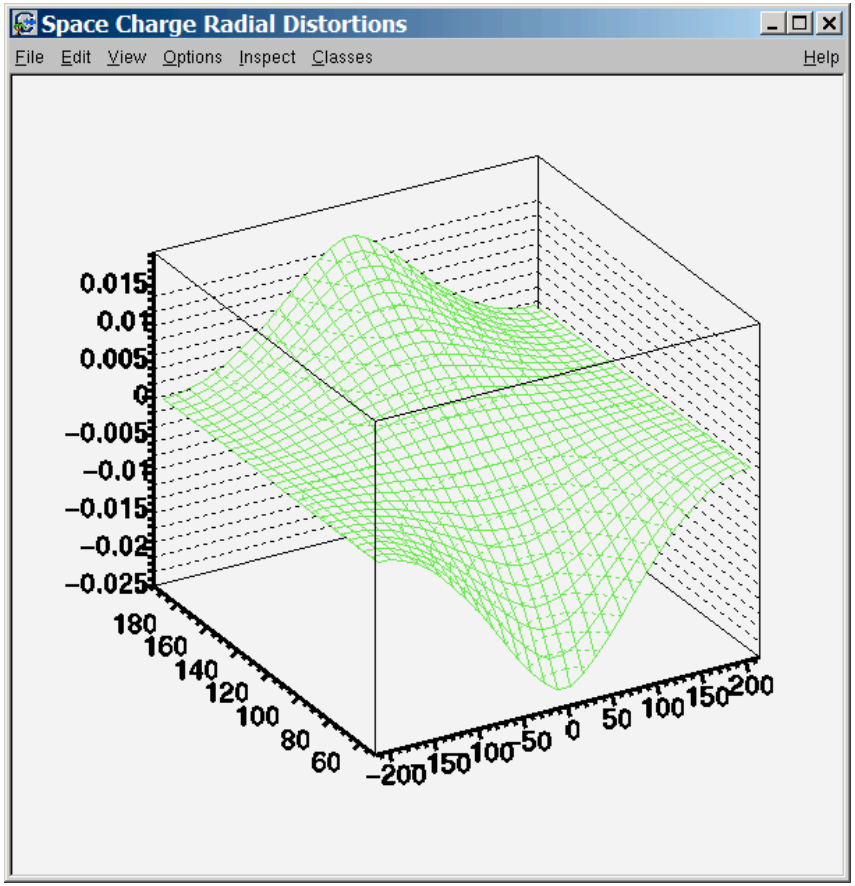


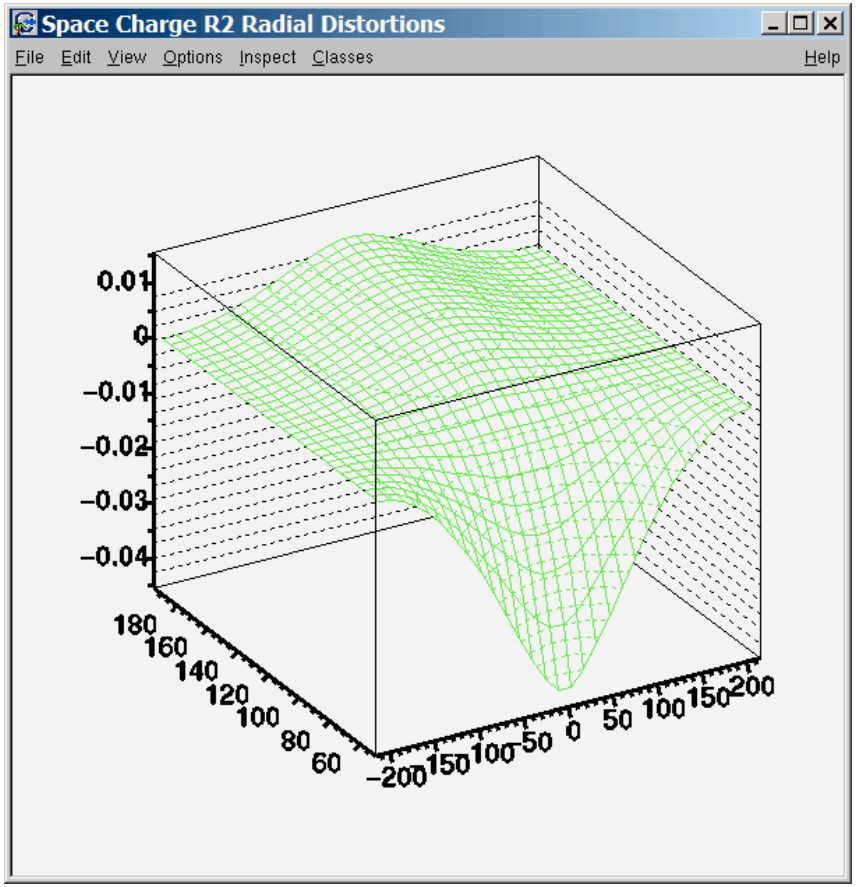




- **New Model**
  - Beam gas events leave a 1/R**2 distribution of charge in the TPC
  - The charge from the events is not significant in the 2001 data, but in the future (including this year) ???

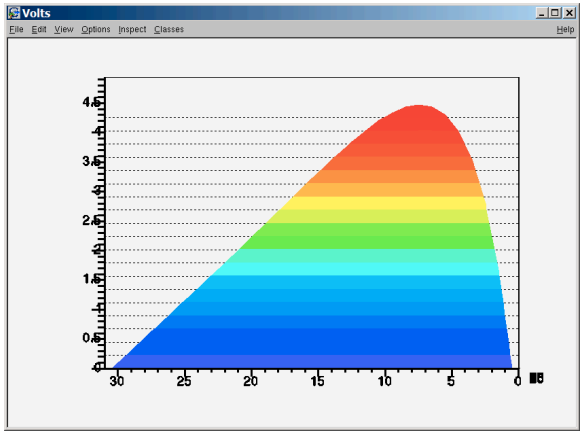
Uniform .vs. $1/R^2$ Space Charge Distribution



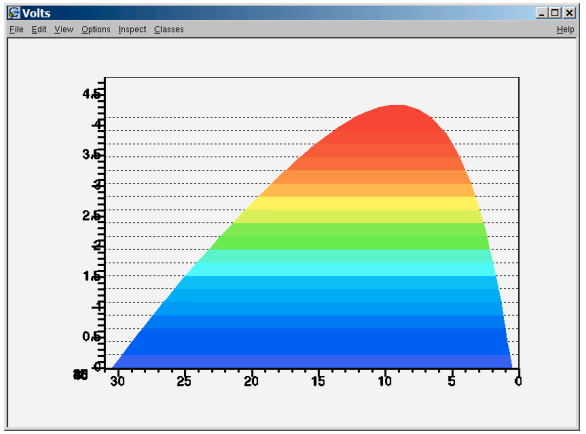


Radial Distortions

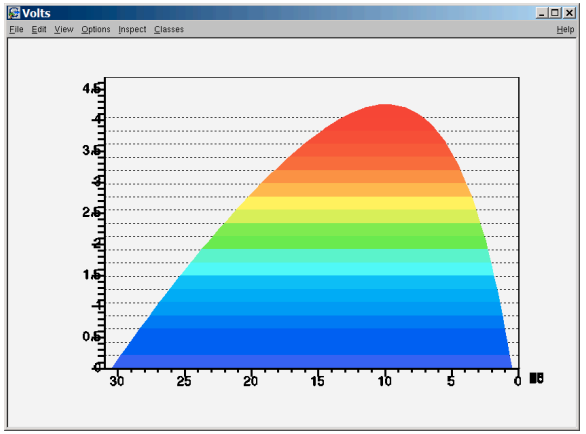
A Wide Range of Distributions



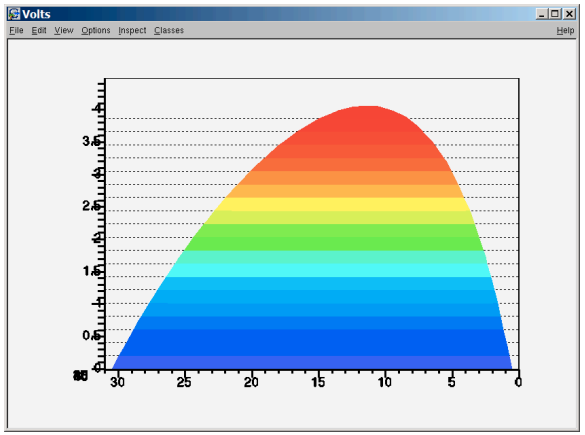
$1/R^3$



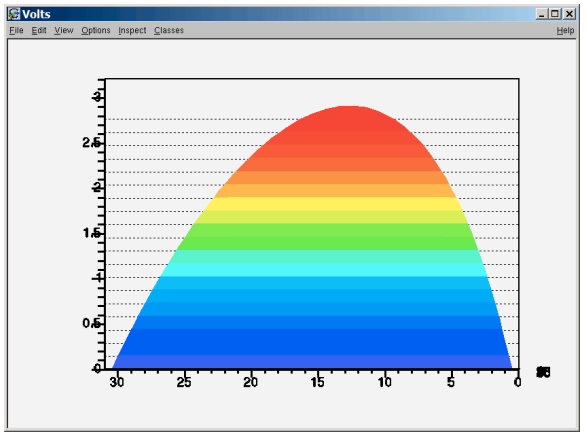
$1/R^2$



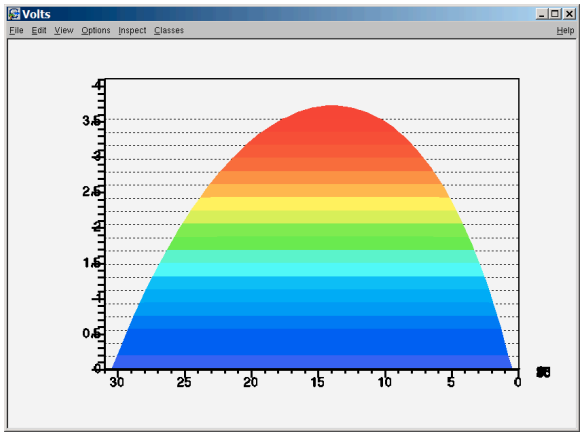
Wieman's HiJet



1/R



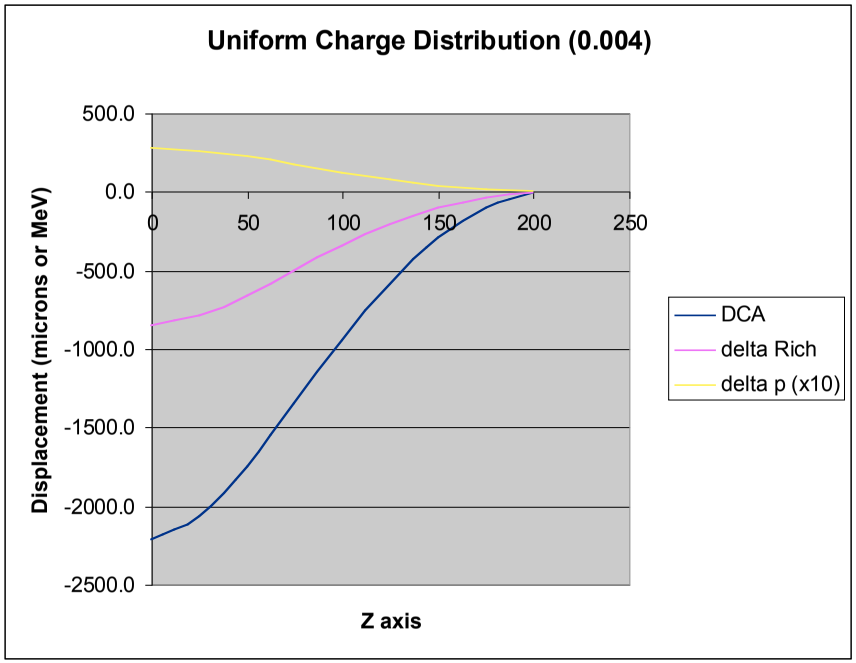
Linear 2:1

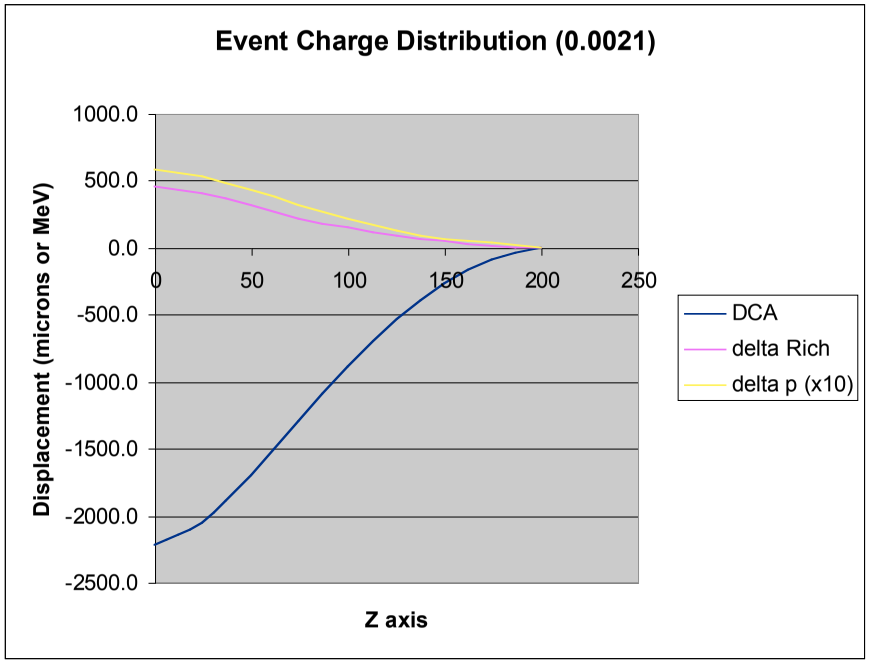


Linear

These (and other) Distributions are Available in StMagUtilities

DCA, Steering at the RICH, and □p

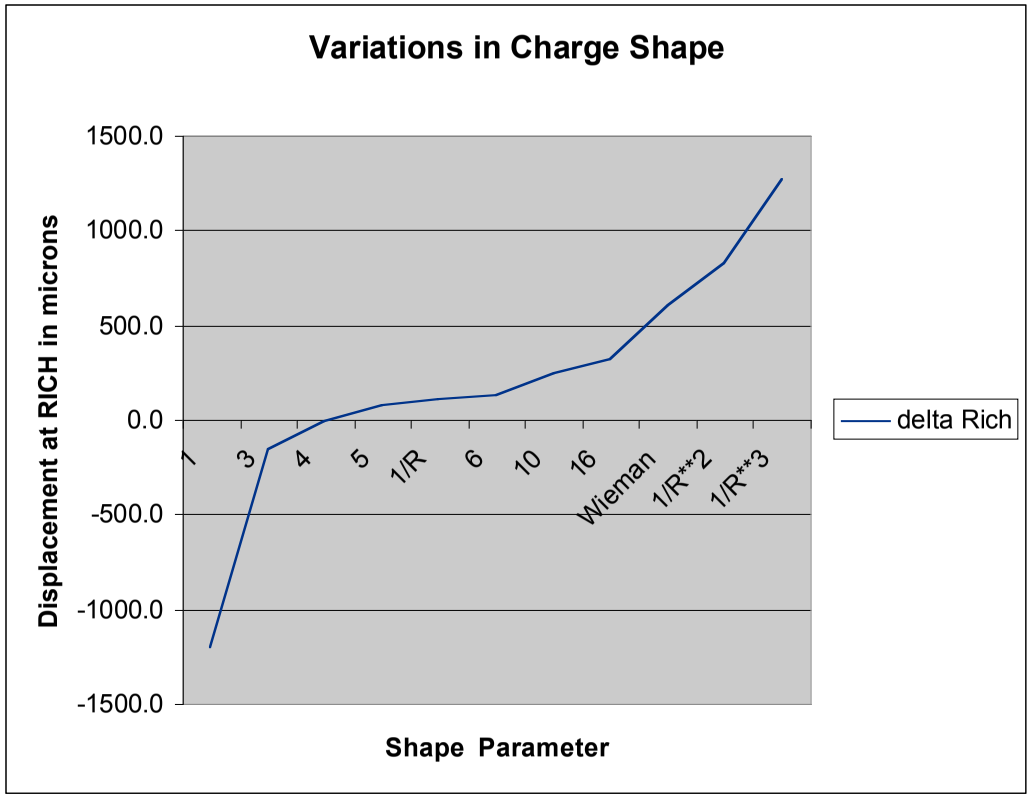




- The RICH Scaler has an arbitrary normilization
- The DCA's have been tuned to be the same in both cases
- □p is different by a factor of 2
- Steering at the Rich changes sign under these conditions

2 Equations, 2 Unknowns

- **We can simultaneously fit the DCAs and match the steering at the RICH due to the beam gas induced space charge**
  - **Choose the right charge distribution 1/R, $1/R^2$, HiJet, etc.**
  - **Choose the RICH scaler normalization constant**



Conclusions

- SpaceCharge corrections are significant today
  - And at 40x <$\mathcal{L}$>
- Tools are available to calculate the corrections
  - Two sources of spacecharge
- We need scalers and diagnostics for each source of charge
  - Monitor $\mathcal{L}$
  - Monitor beam current
- The RICH Mult Scaler is gone
  - We need a replacement
    - Record all events where CTB hits exceed 16
    - This is a job for the trigger group
- We need to track the beam current and/or the distribution of charge in the TPC for untriggered events.
  - Ideas?
- Recent progess with the laser cluster finder means we will be taking laser data during the runs.

Contingency Trigger Plan Needed

- **RHIC ran protons last year and so they can do it again**
  - The proton run is a shoe-in
  - But it is contingent on achieving 40%(?) polarization at the source
- **There is a small probability that the machine folks can't run a deuteron beam**
  - Source to AGS transport problems
  - RHIC tuning issues (first attempt at asymmetric beams)
  - neutron background
- **If the machine folks are forced to punt on either issue, then there will be a mad rush to run a different beam**
  - The exact choice of beams will be a long messy conversation, on short notice, in a smoke filled room.
- **We need a contingency trigger plan for symmetric heavy ions**
  - Running at higher multiplicity than either p-p or d-Au